

**RESPONSES TO EPA TECHNICAL MEMORANDUM DATED 5 FEBRUARY 2004  
ON THE SITE 16 QAPP FOR HRC INJECTION PILOT STUDY OF SEPTEMBER 2003  
NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE  
NORTH KINGSTOWN, RHODE ISLAND**

**GENERAL COMMENTS**

*[This Technical Memorandum has been formatted to facilitate response by separating the text in the subheaded sections into numbered items, as deemed appropriate.]*

The purpose of the technical memorandum is to identify the locations for needed additional groundwater monitoring to adequately evaluate the effectiveness of the proposed HRC® pilot study and provide sufficient monitoring of potential down gradient groundwater quality impacts. The recommendations provided in this technical memorandum are based upon review of the HRC® Pilot Study QAPP, Navy responses to USEPA comments on that document, and the Site 16 Phase I and II Remedial Investigations Reports. In order for the proposed HRC® pilot study to maximize the usefulness of data collected, and provide protection of human health and the environment, it must achieve at least four objectives.

1. Provide adequate quantification of background or "up gradient" groundwater quality for inflowing groundwater not altered by the effects of HRC® injection.
2. Provide adequate delineation of the extent of the inferred localized source area in the vicinity of the HRC® pilot test.
3. Provide a proper frame work for effective evaluation of the resulting groundwater quality changes resulting from the injection and subsequent effects of HRC®.
4. Provide accurate monitoring of down gradient groundwater for adverse degradation products resulting from the injection of HRC®.

Achievement of these objectives is limited by continuing data gaps related to groundwater quality and hydraulics in the area north of the former Building 41 footprint and just south of Davisville Road, and groundwater hydraulics down gradient of that location, particularly in the shallow groundwater zone. In particular, the groundwater flow patterns up gradient and down gradient of the proposed pilot test location are, at best, variable and to the north of the former Building 41 location, undefined. This uncertainty has the potential to significantly impact evaluation of the pilot study effectiveness and fully assess down gradient impacts from the proposed HRC® pilot study.

Therefore, the following general monitoring well locations are recommended and depicted on the attached figure. These recommendations make maximum use of existing Phase I and II Remedial Investigation wells and planned pilot study monitoring wells. Two new monitoring well quadruplets are recommended in addition to four shallow groundwater monitoring wells in the down gradient area that is presently devoid of them. The new quadruplet wells should be

located after additional geophysics is used to fill in data gaps of the knowledge of the top of bedrock north of the former Building 41. The pilot study injection/extraction and internal monitoring wells should be located/installed after the new monitoring wells have been installed and sampled for VOC and groundwater surface contour maps have been prepared.

### Background Monitoring

1. Background monitoring locations must not be impacted by significant contributing contaminant levels that might affect the observed results of the pilot test. The background or "up gradient" monitoring wells proposed in the pilot study are not background wells and therefore, do not fulfill this objective. A true up gradient background line of wells should be established. This line should consist of the wells at locations MW16-12, MW16-31, MW16-11, and a new well quadruplet north of the former Building 41 location and just south of Davisville Road. This is shown as Line 1 on the attached figure.

**Response:** The Navy agrees with this 'Line 1' of monitoring wells as shown on the attached figure. However, some of the existing wells were not accurately located on the figure provided by EPA, the locations for EPA's additional or moved wells were added to the CAD file for this drawing so that the existing monitoring wells plot in their proper locations. The monitoring well locations, which were added or moved by EPA, are shown by 'red' colored symbols. The additional monitoring well location was generally agreed to during the 12 December 2003 BCT meeting. However, it is assumed that the actual location of the added well quadruplet can adjusted in the field so it is not within the relatively new storm water retention pond in that area, but rather located south of Davisville Road and north of the existing chain-link fence.

2. The Navy should also gather shallow groundwater data at the available shallow wells at locations MW16-33 and MW16-34. If these are not planned to be included in the groundwater sampling program then Navy should install a shallow well at the MW16-12 location to tighten up-gradient control.

**Response:** The Navy plans to install and sample a shallow well at the MW16-12 location.

### Source Area Monitoring

3. The wells referred to in the pilot study work plan as "background wells" are actually source area wells, not background wells. That is, MW16-14D and MW-32D exhibit high levels of chlorinated volatile organic contamination. Monitoring of those wells is acceptable if used for the first purpose, source area monitoring, keeping in mind that there has not been a delineation of the inferred source area described in the pilot study work plan. Specifically, there is a data gap to the north side of the former Building 41 footprint.

**Response:** Comment noted.

4. Also, MW16-37S/I has been shown to be a major potential contributing source area that could impact groundwater quality in the down gradient area of the pilot test and mask results.

In order to fully assess this "source area," a line of wells including MW-37S/I/D, MW16-14D, MW16-32D, and a new monitoring well quadruplet installed on the north side of the former Building 41 footprint is needed. This is shown as Line 2 on the attached figure. EPA agrees with the Navy's original proposal to add rock wells to locations MW16-32 and MW16-14 to further expand our understanding of the bedrock system in this source area, however, would be willing to negotiate the removal of these proposed rock wells for this pilot study due to the focus of the pilot study being in the overburden.

**Response:** The Navy agrees with this 'Line 2' of monitoring wells. The additional monitoring well location was generally agreed to during the 12 December 2003 BCT meeting. However, it is assumed that the actual location of the added well quadruplet can be adjusted in the field to lessen its impact on that area where new cars are parked.

### Near-Term Down Gradient Monitoring

5. Several proposed groundwater monitoring wells are proposed within and immediately adjacent to the HRC® pilot injection points. These wells are interpreted by EPA to be process monitoring wells, rather than down gradient monitoring wells. The first line of true near-term down gradient monitoring wells is interpreted to be the line of four proposed well locations that align with MW16-16 I & D. However, these wells are not optimally positioned due to the uncertainties in groundwater flow patterns from the area of HRC® injection. Therefore, it is recommended that the positions of those wells be adjusted as shown on the attached figure. Those wells, along with MW16-16 I & D constitute Line 3. No additional new well locations are required for this line. EPA requests that these proposed well clusters to consist of intermediate and deep wells rather than deep and rock wells since the pilot study focus has changed from the bedrock system to the deep overburden.

**Response:** Two of the 'process monitoring' well quadruplets have been deleted so those resources can be used at the 2 new well quadruplet locations (Lines 1 and 2). The Navy agrees with the minor shifting of the proposed monitoring wells along Line 3 with the following minor revision: move the southern 2 proposed monitoring wells each 5-10 ft northwest along Line 3 for better coverage of the migration of the main plug of the injected HRC® and so the southern of these 2 well pairs is a minimum of 10 ft from the railroad tracks.

### Longer-Term Down Gradient Monitoring

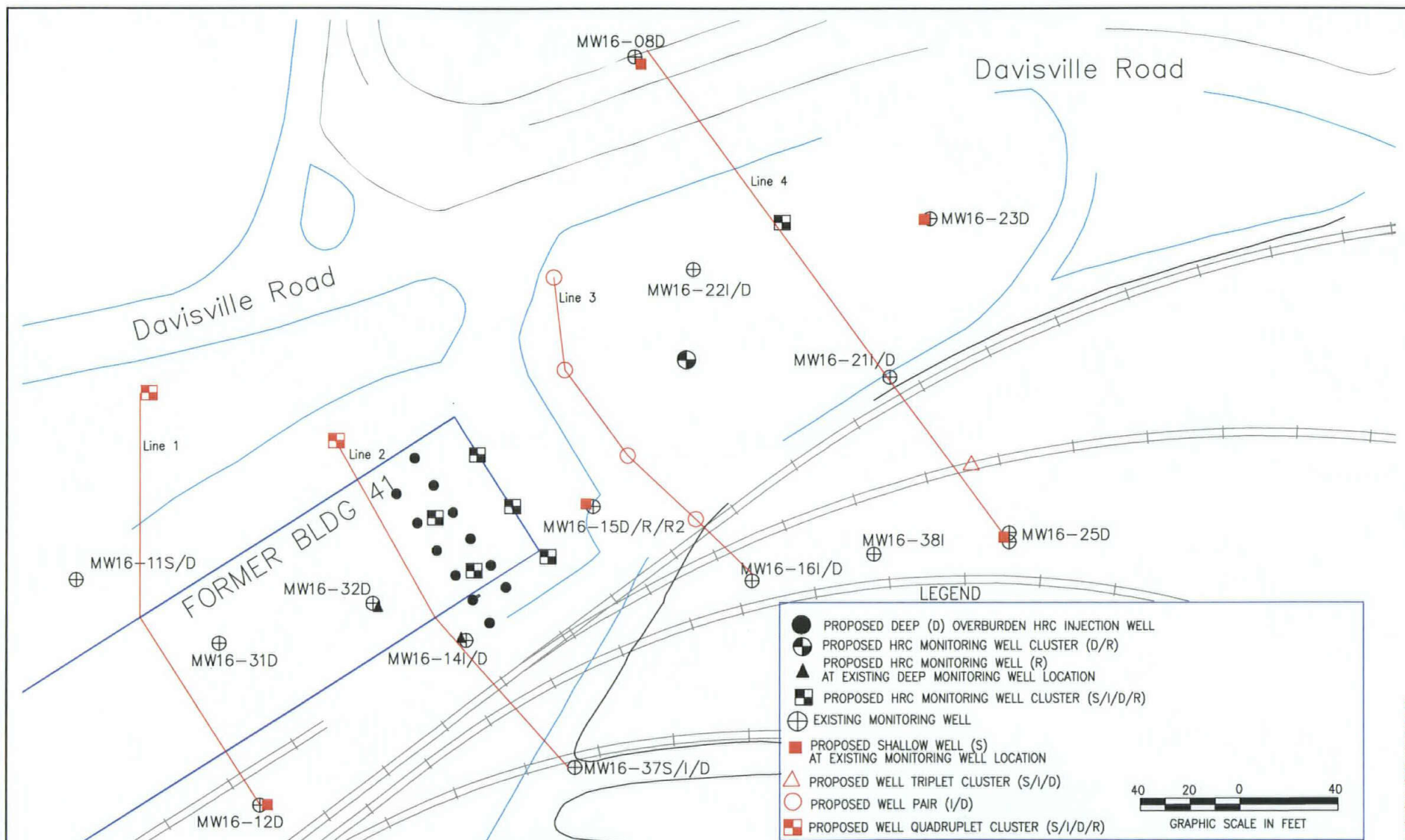
6. A second line of down gradient monitoring is necessary to evaluate groundwater quality changes resulting from the proposed pilot study. This line is shown on the attached figure as Line 4. It consists of existing monitoring wells MW16-25D, MW16-21I and D, MW16-23D, and MW16-08D along with augmentation by two additional well clusters already proposed. The two wells located down gradient of the Line 3 wells, should be shifted as shown on the attached figure. One should be moved to between MW16-23D and MW16-08D, just south of Davisville Road and the other to between MW16-21D and MW16-25D. No additional well locations are required for this line. The well clusters should consist of shallow, intermediate, and deep well screens.

**Response:** The Navy agrees with this 'Line 4' of monitoring wells with the following suggestions: 1) MW16-25 will be used in lieu of the southernmost of EPA-proposed well triplets because it is too close to MW16-25 to be cost effective, and 2) the installation of a rock (R) well to northern proposed well triplet (now a quadruplet) location so the potential downward migration from the injection interval (deep overburden) can be assessed. The rock well will also provide important vertical hydraulic gradient data between the deep overburden and the upper bedrock zones. Additionally, the Navy believes that a deep overburden and upper bedrock monitoring well pair is still appropriate to be located between Lines 3 and 4 so the migration of the HRC® can be tracked along the length of its interpreted flow path approximately midway from the nearest rock monitoring well toward both the northeast and southwest directions.

### Shallow Groundwater Hydraulics

7. Shallow groundwater flow patterns are not resolved up-gradient, at, nor down gradient of the proposed pilot test. Therefore, EPA believes it is necessary to construct a shallow monitoring well at MW16-15D, MW16-08, MW16-23D, and MW16-25D to complete resolution of down-gradient shallow groundwater flow patterns and assist in monitoring of shallow groundwater quality. In the previous paragraphs EPA has requested either a shallow well screen be installed at the MW16-12 location or that MW16-33 S and MW34S be included for gauging as part of the pilot test. Additionally, the two new monitoring well locations north of former Building 41 have been requested to have shallow well screens installed.

**Response:** The Navy agrees with the installation of the 4 shallow monitoring wells. Please see the Navy's responses to EPA Comment No. 2 regarding MW16-12 and EPA Comment Nos. 1 and 4 regarding the two new monitoring well locations north of former Building 41.



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EFANE  
SITE 16 HRC INJECTION PILOT TEST  
FORMER NCBC DAVISVILLE FACILITY  
NORTH KINGSTOWN, RHODE ISLAND

### SITE MAP

(RED WELL DESIGNATIONS ARE THOSE LOCATIONS REQUESTED BY EPA TO BE ADDED OR MOVED)

DESIGNED BY JAS	DRAWN BY RWC	DATE 2/20/04	PROJECT NO. 2960107	FILE NAME FIG 5
CHECKED BY RWC	PROJECT MGR. JAS	SCALE AS SHOWN	DRAWING NO. -	FIGURE Figure 5A